Thermochemistry Notes

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1 Vocabulary

1. The **system** is the part of the universe that we are studying.
2. The **surroundings** are everything else in the universe.
3. The **universe** consists of the system and the surroundings.

2 Laws

1. The **1st law of thermodynamics** is $\mathbf{\Delta E = q + w}$.
   (a) $\mathbf{\Delta E}$ is the change in the internal energy of the system.
   (b) The internal energy is the sum of all the kinetic and potential energies of the components of the system.
   (c) **q** refers to the heat absorbed or released by the system.
      - **q** is **positive** when heat flows **into** the system **from** the surroundings and **negative** when heat flows **from** the system **into** the surroundings.
   (d) **w** refers to the work done on or done by the system.
      - **w** is **positive** when work is done **on** the system **by** the surroundings and **negative** when work is done **by** the system **on** the surroundings.

3 Problems and Applications

1. 1st law on combustion of propane in open container at constant pressure.

$$\mathrm{C_3H_8\,(g) + 5\,O_2\,(g) \longrightarrow 3\,CO_2\,(g) + 4\,H_2O\,(g)}$$
$$q = -2044 \text{ kJ},\ w = -2 \text{ kJ}$$
$$\Delta E = q + w = (-2044) + (-2) = -2046 \text{ kJ}$$
$$q_p = \Delta H = -2044 \text{ kJ}$$

4 Enthalpy

An **endothermic** (ΔH is $+$) process is where heat is transferred to the system, while an **exothermic** (ΔH is $-$) process is where heat is transferred out of the system.